Technical Report 69-14

The Effects of Changes in Transition Firing Upon "Quick Kill" Proficiency

by

Joseph A. Olmstead and T.O. Jacobs

HumRRO Division No. 4 (Infantry)

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This report describes a study to determine the effects of modifications in "Quick Kill" rifle training on the proficiency of basic combat trainees. The report should be of interest to those concerned with rifle marksmanship and weapons training.

FOR THE CHIEF OF RESEARCH AND DEVELOPMENT:

1 Incl
as

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SUMMARY AND CONCLUSIONS

The Problem

The purpose of the study was to determine the effects of several modifications in "Quick Kill" training upon the proficiency of Basic Combat Training (BCT) trainees in using Quick Kill firing techniques. The study was designed to evaluate the effects of the following changes in Transition Firing: (a) deleting use of the training rib device on the rifle, (b) reducing range and number of targets from three targets at 15, 30, and 50 meters to two targets at 20 and 50 meters, and (c) reducing total number of rounds fired from 60 to 30. In addition, opportunity arose during the course of the study to evaluate the effects of reducing time in the Air Rifle practical exercises that precede Transition Firing, from three hours to one and one-half hours.

Method

The study was conducted with 12 companies of BCT trainees at the U.S. Army Training Center, Fort Benning, Georgia. Eight experimental groups were constructed so that, within each company, equal numbers of trainees received Transition Firing comprised of all combinations of rib versus no rib, two versus three targets at 20-50 meters or 15-30-50 meters respectively, and 30 versus 60 rounds.

During the early stages of data collection, it was learned that four of the companies had received only one and one-half hours of Air Rifle practical exercises, as contrasted with the usual three hours. Data on these four companies were kept separate, thus permitting a comparison between them and the remaining eight companies which received three hours of Air Rifle practical exercises. Only the companies with three hours of practice were included in the analysis of effects of Transition Firing variables.

Effects of the experimental conditions were evaluated on the basis of a criterion test administered at the completion of Transition Firing. In the criterion test each trainee was required to fire 15 rounds within 60 seconds at a 50-meter target using Quick Kill techniques without the training rib on the rifle. Score was number of hits achieved. The M14 rifle was used for both Transition Firing and the criterion test.

Results

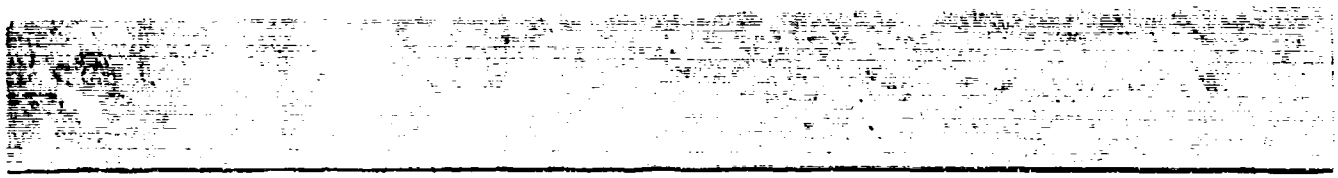
(1) Trainees who used the temporary training rib on the rifle in Transition Firing achieved significantly more hits on the criterion test than those who did not use the rib.

(2) No significant differences were found between trainees who were trained with two targets at 20 and 50 meters and those who were trained with three targets at 15, 30 and 50 meters.

(3) No significant differences were found between trainees who fired 30 rounds during Transition Firing and those who fired 60 rounds.

(4) A mean criterion score of 8.3 hits was achieved by the group that in training had fired 60 rounds at 15, 30, and 50 meter targets using the rib, and a mean score of 8.0 was achieved by the group that had fired 30 rounds at 20- and 50-meter targets using the rib. These two groups achieved the highest scores in the study and the difference between them is not significant.

(5) Trainees who received three hours of Air Rifle practical exercises achieved significantly more hits than those who received one and one-half hours.



Conclusions

(1) Use of the training rib in Transition Firing produces superior results.

(2) No significant decrement in Quick Kill proficiency results if rounds are reduced to 30, provided targets are also reduced to two at 20 and 50 meters and the rib is retained.

(3) Reducing rounds without a corresponding reduction in targets would reduce proficiency.

(4) Three hours of Air Rifle practical exercises produce results superior to those obtained with one and one-half hours of practical exercises.

CONTENTS

The Effects of Changes in Transition Firing Upon "Quick Kill" Proficiency

INTRODUCTION

This study was conducted to determine the effects of several possible modifications in "Quick Kill" rifle training upon the proficiency of Basic Combat Training (BCT) trainees in using Quick Kill firing techniques. Specifically, the study was designed to evaluate the effects of changes in use of the training rib device on the rifle, range and number of targets, and ammunition expended during the Transition Firing phase of Quick Kill training. In addition, the effects of reducing the amount of time spent in the Air Rifle phase was evaluated.

The study was initiated and conducted by the Small Arms Committee, Weapons Department, U.S. Army Infantry School (USAIS) at Fort Benning, Georgia. Assistance in design of the study was provided and the data were analyzed and interpreted by HumRRO Division No. 4 (Infantry).

BACKGROUND

"Quick Kill" is a method of fast, effective, unaimed fire of short ranges at fleeting targets. Basically, Quick Kill training is a method for teaching a person to effectively engage a target without first aligning the sights of his weapon, a method that was developed and refined for military use from a technique known among civilians as "Instinct Shooting."

At present, Quick Kill is taught as a part of Basic Rifle Marksmanship (BRM) training. In most instances, a block of instruction covering Quick Kill techniques is provided early in BRM. The intrinsic interest in marksmanship generated by Quick Kill and the fact that Quick Kill instruction begins with an air rifle are assumed to provide a helpful and positive introduction to marksmanship training.[1]

At present, the procedure recommended by the Infantry School is that Quick Kill training be given during Periods Three and Four of the BRM program, immediately after training in clearing, disassembly, and assembly of the service weapon. Air Rifle training (Period Three) includes introduction to Quick Kill (one hour) and practical exercises (three hours) in, first, firing at aerial targets and, second, firing at ground targets, using the Quick Kill techniques. Transition Firing (Period Four) is a practical exercise (four hours) with the service weapon.

Transition Firing is intended to bridge the gap between firing of the air rifle, which has no sights, and the firing of the service weapon, which is equipped with sights. While firing the air rifle, the trainee learns to look at the target and not at his weapon. This is easy to do with the air rifle because no sights protrude above the barrel to distract his eyes from the target. When the trainee locks his service weapon into the pocket of his shoulder, however, he is not only inclined to be distracted by the prominent sights but, also, he is frequently unable to pick up the top plane of the barrel in his peripheral vision as prescribed in Quick Kill.

[1]For further information, see *The Effects of "Quick Kill" Upon Trainee Confidence and Attitudes*, by Joseph A. Olmstead, HumRRO Technical Report 68-15, December 1968.

Although the effective Quick Kill shooter does not consciously align his barrel when picking up his target, he still must be able to maintain the proper relationship of barrel to target in his peripheral vision. During Transition Firing, trainees are prevented from being distracted by the sights and are assisted in maintaining the proper barrel-to-target relationship by the use of a "training rib" and by the covering of the front and rear sights of the service weapon with tape.

The training rib is a device attached to the barrel of the service weapon so that a straight-line plane exists between the tops of the front and rear sights, as shown in Figure 1. Use of the rib allows the trainee to look over the weapon rather than along the barrel, as he learned to do with the air rifle.

The M14 Rifle Equipped With Temporary Training Rib

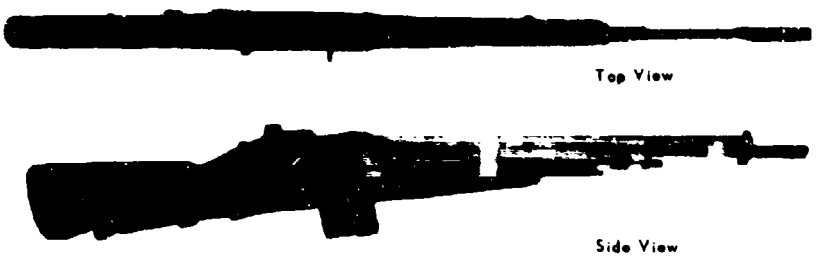


Figure 1

In Transition Firing, the trainee initially engages an E-type silhouette target at a range of 15 meters, using the service weapon equipped with the training rib. After firing five rounds, trainee and instructor move forward to the target, examining the pattern of hits. Following the instructor's correction of any errors in technique, the trainee shoots another five rounds at 15 meters, totaling 10 rounds with the rib at this distance.

The firing line is then moved back to 30 meters, from which point the trainee fires 10 rounds. Finally, the trainee moves back to 50 meters, at which distance he also fires 10 rounds; then his effectiveness is again checked. Thus, in all, the trainee fires 30 rounds, using the rib, on targets at distances of 15, 30 and 50 meters. The training rib is then discarded, and the trainee again fires the three ranges, engaging each target with the same number of rounds as before. Both front and rear sights remain covered with tape throughout the exercise.

In summary, Transition Firing, as it is now conducted, includes 30 rounds fired with the rib and 30 rounds without it, for a total of 60 rounds. Within each of these two conditions, 10 rounds each are fired at ranges of 15, 30, and 50 meters.

RESEARCH PROBLEM

The purpose of this study was to evaluate the effects on Quick Kill proficiency of use of the training rib, number of rounds fired, and range and number of targets engaged, during Transition Firing. From a practical standpoint, the results would determine whether use of the training rib could be discontinued and both number of rounds fired and number of target ranges could be reduced

without a decrease in Quick Kill proficiency of trainees. Because of the large numbers of BCT trainees who annually receive Quick Kill training, deletion of the rib, or reduction in either ammunition expended or range and number of targets, could result in considerable savings for the Army in both money and time required for training.

Specifically, the study was designed to answer the following questions:

(1) Can use of the training rib on the service weapon be deleted from Transition Firing without a reduction in Quick Kill proficiency?

(2) Can the number of ammunition rounds expended during Transition Firing be reduced from 60 to 30 per trainee without a reduction in Quick Kill proficiency?

(3) Can the number and ranges of targets used in Transition Firing be reduced from three at 15, 30, and 50 meters to two at 20 and 50 meters without a reduction in Quick Kill proficiency?

Although time required to complete the Air Rifle training phase, which precedes the training in Transition Firing, was not intended to be a variable in the original experimental design, the opportunity occurred to include it as the study was in progress. As a result, there is a fourth question to be answered by this report:

(4) Can the total time for the practical exercises in Air Rifle training be reduced from three hours to one and one-half hours without a reduction in Quick Kill proficiency?

METHOD

The experiment was designed to study the separate and combined effects on Quick Kill proficiency of each of the three critical variables—training rib, rounds fired, and number and distance of targets. The service weapon used throughout the experiment was the 7.62mm rifle, the M14.

EXPERIMENTAL DESIGN

Experimental groups were constructed so that equal numbers of BCT trainees received Transition Firing comprised of combinations of the critical variables. The combinations of variables used and the number of trainees participating under each experimental condition are shown in Figure 2.

Twelve companies of trainees at the U.S. Army Training Center, Fort Benning, Georgia, participated in the study, with each company receiving the training on one of 12 consecutive duty days. According to the original plan, all 12 companies were to receive identical treatment throughout the study and, within each company, equal numbers of trainees were to receive Transition Firing under each of the experimental conditions.

During the early stages of data collection, the study project officers noted that the first four participating companies of trainees had received only one and one-half hours of practical exercises during the Air Rifle phase preceding Transition Firing, a reduction from the three hours normally administered. The last eight companies received the full three hours of Air Rifle practical exercises. Thus, although this variable had not been included in the original design of the study, an opportunity became available to compare the effects on Quick Kill proficiency of one and one-half versus three hours of Air Rifle practical exercises.

Design of the Study

Time in Air Rifle Training	Training Rib Used				Training Rib Not Used			
	30 Rounds		60 Rounds		30 Rounds		60 Rounds	
	15-30-50 Meters	20-50 Meters	15-30-50 Meters	20-50 Meters	15-30-50 Meters	20-50 Meters	15-30-50 Meters	20-50 Meters
3 Hours (8 companies of BCT trainees)	Group 1 $N=112$	Group 2 $N=112$	Group 3 $N=112$	Group 4 $N=112$	Group 5 $N=112$	Group 6 $N=112$	Group 7 $N=112$	Group 8 $N=112$
1½ Hours (4 companies of BCT trainees)	$N=46$	$N=46$	$N=46$	$N=46$	$N=46$	$N=46$	$N=46$	$N=46$

NOTE: Within each company, equal numbers of trainees participated under each condition.

Indicates current procedure for Transition Firing

Figure 2

The study design was accordingly modified to include eight companies participating under the original design with three hours of Air Rifle practical exercises and four companies participating under a modified design with only one and one-half hours of practical exercise. The four companies in the modified design came from a single training battalion, thus introducing the possibility of bias. However, the possible bias may be neutralized somewhat by the fact that a fifth company from the same battalion participated under the original design. Further, training battalions are mainly administrative units and are not considered to be sufficiently homogeneous to cause serious bias in results. The modification in design is reflected in Figure 2.

SUBJECTS

Personnel participating in the study were 1,264 BCT trainees in 12 companies from five battalions at the U.S. Army Training Center, Fort Benning, Georgia. In order not to disturb ongoing training activities, companies were kept intact as constituted by the Center for routine administration.

After selection of a company for participation, personnel records of its members were surveyed to ensure that the company was not unusual, compared with the other companies, with regard to Armed Forces Qualification Test (AFQT) score category, education level, or other factors that might affect responses. Since no important biases were found and the personnel were deemed representative, no companies were rejected.

Equal numbers of trainees within each company participated under each of the experimental conditions. Because the number of trainees within each company was not the same, however, the number of trainees who participated in the study was not equal for each company.

PROCEDURE

The data were collected from 26 September to 12 October 1968. Quick Kill training was given as normally scheduled except that, during the conference

period and demonstration for Transition Firing, a brief explanation of the experiment was presented. Trainees participated in the study one company at a time.

The practical exercises in Transition Firing were conducted as follows:

Group 1 - Trainees fired five rounds at each target at 15, 30, and 50 meters using the training rib, and refired the same course without the rib for a total of 30 rounds.

Group 2 - Trainees fired seven rounds at each target at 20 and 50 meters using the training rib and refired the same course with eight rounds at each target without the rib for a total of 30 rounds.

Group 3 - Trainees fired 10 rounds at each target at 15, 30, and 50 meters using the training rib and refired the same course without the rib for a total of 60 rounds. This is the current procedure for administering Transition Firing training.

Group 4 - Trainees fired 15 rounds at each target at 20 and 50 meters using the training rib and refired the same course without the rib for a total of 60 rounds.

Group 5 - Trainees fired 10 rounds at each target at 15, 30, and 50 meters without the training rib for a total of 30 rounds.

Group 6 - Trainees fired 15 rounds at each target at 20 and 50 meters without the training rib for a total of 30 rounds.

Group 7 - Trainees fired 20 rounds at each target at 15, 30, and 50 meters without the training rib for a total of 60 rounds.

Group 8 - Trainees fired 30 rounds at each target at 20 and 50 meters without the training rib for a total of 60 rounds.

DATA COLLECTION

Data consisted of scores on a criterion test administered to each trainee when all men within a company had completed the practical exercise in Transition Firing. The criterion test was a timed exercise in which each trainee fired 15 rounds within 60 seconds with the service weapon at a 50-meter target using the Quick Kill technique without the training rib. Score for the test was number of hits achieved.

ANALYSIS

Comparisons between the experimental groups and between the critical variables were made on the basis of the criterion scores described above.

TRANSITION TRAINING VARIABLES

The main analysis involved a comparison of the effects of the experimental variables in the Transition Firing phase—training rib, targets, and rounds fired. Since the purpose of the study was to determine whether present training could be modified, and since three hours of practical exercise in Air Rifle training is the currently recommended procedure for Quick Kill training, only scores of trainees from the eight companies that received the three hours Air Rifle training were included in the main analysis. Determination of effects of the variables was accomplished through the use of a 2 x 2 x 2 factorial analysis of variance with 112 entries per cell, as indicated in Figure 2.

TIME IN AIR RIFLE TRAINING

To determine the effects of one and one-half versus three hours of practical exercise in Air Rifle training, a comparison was made between criterion mean scores for the four companies that received one and one-half hours and those for the eight companies that received three hours' training. Since equal numbers of trainees within each company received each combination of variables during Transition Firing, it was considered permissible to pool scores for all trainees within each Air Rifle training condition. Scores were thus pooled and comparisons were made between mean scores for the two Air Rifle training groups.

RESULTS

TRANSITION TRAINING VARIABLES

Mean criterion scores for the various experimental groups are shown in Table 1, combined mean scores for the major variables in Table 2, and the

Table 1

Quick Kill Proficiency After Transition Firing

(Mean Hits on Criterion Test)[a]

Targets	Training Rib Used		Training Rib Not Used	
	30 Rounds	60 Rounds	30 Rounds	60 Rounds
15-30-50 Meters				
Mean	7.0	8.3	6.8	6.8
Standard Deviation	3.9	4.1	4.4	4.5
20-50 Meters				
Mean	8.0	6.8	6.6	7.3
Standard Deviation	4.9	4.4	4.6	4.5

[a]$N = 112$ for all cells.

analysis of variance results in Table 3. Although the experimental groups were trained with combinations of the variables under study, analysis of variance procedures make it possible to extract the effects of each variable both singly and in combination with others.

Effects of the use of the training rib on Quick Kill proficiency proved to be significant, as shown in Table 3. That is, when effects of the other variables are held constant, the difference in proficiency between all groups that used the rib and those that did not use it is statistically significant ($p < .05$). Table 2 shows

Table 2

Quick Kill Proficiency by Variable

(Combined Conditions)[a]

Training Rib		Rounds		Targets	
Rib Used	Training Rib Not Used	30	60	15-30-50 Meters	20-50 Meters
7.5	6.9	7.1	7.3	7.2	7.2

[a]Figures in cells are combined mean score of all groups participating under the condition indicated.

Table 3

Analysis of Variance for Transition Firing

Source	Degrees of Freedom	Mean Square	*F*	*p*
Training Rib	1	85.0	4.3	<.05
Rounds Fired	1	8.3	.4	NS
Targets	1	1.3	.1	NS
Rib x Rounds	1	4.0	.2	NS
Rounds x Targets	1	53.0	2.7	NS
Rib x Rounds x Targets	1	138.2	7.0	<.01
Residual	888	19.6		

the direction of the difference; the mean score for all subjects using the rib is 7.5, while that for subjects not using the rib is 6.9. Thus, Quick Kill proficiency is significantly better when the rib is used during Transition Firing practical exercises.

Table 3 also shows that the effects of both rounds fired and targets are not significant. This indicates that, when each of these variables is considered separately, the experimental manipulations did not produce significant differences in Quick Kill proficiency. As shown in Table 2, for both rounds fired and targets the differences between mean scores for the two conditions of each variable are negligible.

From Table 3, it can be seen that a significant interaction occurred between rib, rounds, and targets. The effects of the interaction are evident in Table 1; when targets at 15, 30, and 50 meters were used, the highest mean hits occurred with 60 rounds fired with the rib, but when targets at 20 and 50 meters were used, highest mean hits occurred with 30 rounds fired with the rib. In short, different combinations of rib, rounds, and targets produce somewhat different effects. Especially noteworthy is the fact that the two highest means differ by only .3 point.

TIME IN AIR RIFLE TRAINING

Table 4 gives a comparison of Quick Kill proficiency after Transition Firing that was preceded by either one and one-half or three hours of Air Rifle practical exercises. As shown in Table 4, three hours of Air Rifle training produces more hits than one and one-half hours of training. The difference

Table 4

Quick Kill Proficiency After 1 ½ and 3 Hours of Air Rifle Training Exercises *

Time in Air Rifle Training	Number	Mean Hits	Standard Deviation	*t*
1½ Hours	32	6.3	1.4	2.67 $p<.01$ ($df=94$)
3 Hours	64	7.2	1.6	

*Based on cell means where a cell represents a company score within each experimental condition.

between the means is statistically significant ($p < .01$), indicating that the difference is not likely to have occurred by chance.

DISCUSSION

Discussion of the results will be mainly in terms of the questions stated in the Research Problem section of this report. In considering the results, one point should be kept in mind. The service weapon used in Transition Firing and the criterion test was the M14 rifle. Accordingly, the results apply only to training in which the M14 is used and they should not be generalized to training in which other weapons are involved until they have been verified for such other weapons.

In regard to the first question of whether use of the training rib on the service weapon can be deleted from Transition Firing without a reduction in Quick Kill proficiency, the results are clear—use of the rib results in more hits on a criterion test than when it is not used.

The second and third questions are concerned with whether the number of ammunition rounds expended during Transition Firing can be reduced from 60 to 30 per trainee, and whether number and ranges of targets can be reduced from three targets at 15, 30, and 50 meters to two targets at 20 and 50 meters, without a reduction in proficiency. Neither rounds nor targets produced significant effects, indicating that, when each variable is analyzed separately across all test conditions, the experimental manipulations did not result in significant differences in Quick Kill proficiency. However, the triple interaction, noted in the Results section and shown in Table 3, indicates that differing combinations of rib, rounds, and targets produce somewhat different results. When 60 rounds are fired, most hits are scored with 15-30-50 meter targets and the rib. But, when 30 rounds are fired, most hits are scored with 20-50 meter targets and the rib. The difference between these conditions is of no practical importance.

It would be possible to speculate about reasons for the interaction effect; however, any definite understanding of it would require further experimental study. For practical decisions concerning training procedures, the important fact is that no significant decrement in Quick Kill proficiency results when rounds are reduced to 30, provided targets are also reduced to two at 20 and 50 meters and provided the rib is retained.

The fourth question is concerned with reduction of time spent in practical exercises in Air Rifle training. Results from the comparison between one and one-half and three hours are clear—the longer period of practical exercise in Air Rifle training produces significantly greater Quick Kill proficiency.

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13. ABSTRACT

This study determined the effects of modifications in "Quick Kill" rifle training on the proficiency of trainees in Basic Combat Training in using Quick Kill techniques. It was concluded that (a) use of the temporary training rib on the rifle in Transition Firing produces superior results, (b) no significant loss in Quick Kill proficiency should result from reducing range and number of targets from three targets at 15, 30, and 50 meters to two targets at 20 and 50 meters, retaining the training rib, (c) reducing total number of rounds fired from 60 to 30 without a reduction in targets would result in reduced proficiency, and (d) three hours of Air Rifle practical exercises produce results superior to one and one-half hours of exercises.

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